WOODS HOLE OCEANOGRAPHIC INSTITUTION

REFERENCE NO. 69-70

A KEY TO THE STROMATEOID FISHES

by

Richard L. Haedrich and Michael H. Horn

WOODS HOLE, MASSACHUSETTS

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TECHNICAL REPORT

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Approved for Distribution

John H. Ryther, Chairman
Department of Biology

Our primary purpose in preparing "A Key to the Stromateoid Fishes" is to provide field workers and curators with a convenient and concise aid for the identification of the diverse species in this somewhat difficult group. Secondarily, we hope to present, through the keys, a summary of the present state of our knowledge of these fishes, and to indicate areas where further investigation is needed.

The keys which compose this handbook have been derived from several sources. Some are slightly modified from already published or about-to-be-published sources. Others form a part of manuscripts in preparation. A third group of keys has been constructed from published species descriptions and our own often meagre data.

The keys are intended primarily for larger specimens. Small stromateoids are particularly confusing, and it is not our purpose to treat them here. The well-known and marked allometric growth in stromateoids remains a problem, and those who use these keys should be aware that the body proportions of very large and/or very small specimens can fall well outside the limits here set. We expect and hope for corrections and improvements to the keys, and have left them double-spaced so comments may be written in by users. We have not attempted to settle nomenclatural problems, but have used the oldest name we know of when a choice is necessary. Neither have we gone into the problem of synonymy to any great extent. In some cases we have approached this problem by including two names under one couplet in a key. The choice of which name to employ is thus passed on to the user.

Two new names have been used - *Psenes sio* and *Peprilus ovatus*.

The first is from a manuscript in preparation by Haedrich. The second is from a manuscript by Horn, "Systematics and biology of the stromateid fishes of the genus *Peprilus*", Bull. Mus. Comp. Zool., Harvard, (in press). This handbook is an UNPUBLISHED MANUSCRIPT, and, until the formal descriptions appear, these names should be treated as manuscript names.

Following the key to families and genera, the individual generic keys are arranged in alphabetical order. A list of the included taxa follows. The more commonly used generic synonyms follow the proper name in parentheses.

Order Perciformes
Suborder Stromateoidei
- Family Amarsipidae
  - Genus *Amarsipus*
    - *Amarsipus carlsbergi*
- Family Ariommidae
  - Genus *Ariomma (=Paracubiceps)*
    - *Ariomma bondi*
    - *Ariomma evermanni*
    - *Ariomma indica*
    - *Ariomma lurida*
    - *Ariomma melana*
    - *Ariomma regulus*
- Family Centrolophidae
  - Genus *Centrolophus (=Pompilus)*
    - *Centrolophus niger*
  - Genus *Hyperoglyphe (=Palinurichthys)*
    - *Hyperoglyphe antarctica*
    - *Hyperoglyphe bythites*
    - *Hyperoglyphe japonica*
    - *Hyperoglyphe moselii*
    - *Hyperoglyphe perciforma*
  - Genus *Icichthys*
    - *Icichthys australis*
    - *Icichthys lockingtoni*
    - *Tubbia tasmanica*
  - Genus *Psenopsis*
    - *Psenopsis anomala*
    - *Psenopsis cyanea*
    - *Psenopsis obscura*

Genus *Schedophilus (=Leirus, Mupus)*
Schedophilus griseolineatus
Schedophilus huttoni
Schedophilus maculatus
Schedophilus medusophagus
Schedophilus ovalis
Schedophilus pemarco
Genus *Seriolella (=Neptomenus)*
Seriolella brama
Seriolella porosa
Seriolella punctata
Seriolella violacea

Family Nomeidae
Genus *Cubiceps*
Cubiceps athenae
Cubiceps caeruleus
Cubiceps capensis
Cubiceps carinatus
Cubiceps gracilis
Cubiceps longimanus
Cubiceps pauciradiatus
Cubiceps squamiceps
Genus *Nomeus*
Nomeus gronovii
Genus *Psenes*
Psenes arafurensis
Psenes cyanophrys
Psenes maculatus
Psenes pellucidus
Psenes sio
Psenes whiteleggii

Family Stromateidae
Genus *Pampus (=Stromateoides)*
Pampus argenteus
Pampus chinensis
Pampus echinogaster
Genus *Peprilus (=Poronotus)*
Peprilus burti
Peprilus medius
Peprilus ovatus
Peprilus paru
Peprilus simillimus
Peprilus snyderi
Peprilus triacanthus
Genus *Stromateus*
Stromateus brasiliensis
Stromateus fiatola
Stromateus stellatus

Family Tetragonuridae
Genus *Tetragonurus*
Tetragonurus atlanticus
Tetragonurus cuvieri
Tetragonurus pacificus

The key to families and genera is composed for the most part from keys published by R. L. Haedrich in "The stromateoid fishes: systematics and a classification" Bull. Mus. Comp. Zool., Harvard, 135 (2): 31-139 (1967). The summary of that paper states:

> "The marine perciform suborder Stromateoidei is diagnosed by the possession of toothed pharyngeal sacs and small uniserial teeth in the jaws. Comparative study of the nature of the pelvic and dorsal fins, the dentition, the number of vertebrae and branchiostegals, and the structure of the caudal skeleton and pharyngeal sacs suggests a division of the suborder into 5 families and 14 genera: Centrolophidae- *Hyperoglyphe, Schedophilus, Centrolophus, Icichthys, Seriolella, Psenopsis;* Nomeidae - *Cubiceps, Nomeus, Psenes;* Ariommidae - *Ariomma;* Tetragonuridae - *Tetragonurus;* and Stromateidae - *Stromateus, Peprilus, Pampus.* In proceeding from the generalized to the highly evolved within the suborder the maximum size attained becomes smaller, the body becomes deeper, the pelvic fins are lost, the pharyngeal sacs become more elongate and the structure of the papillae within them becomes more complex, the number of branchiostegals and the number of elements in the caudal skeleton is reduced, and the number of vertebrae is increased. The major features of the centrolophid distribution are discontinuity, bipolarity, endemism, and sympatry of genera. The oceanic nomeids and tetragonurids are broadly sympatric in all oceans. The ariommids are found in deep water over the edge of the continental shelves from the east coast of the New World to Japan, and near Hawaii. The stromateid distribution is characterized by discontinuity, widespread species, and allopatry of genera. The relationships and natural history of the stromateoid taxa are discussed. Synonymies, keys, and, under each genus, lists of nominal species are included."

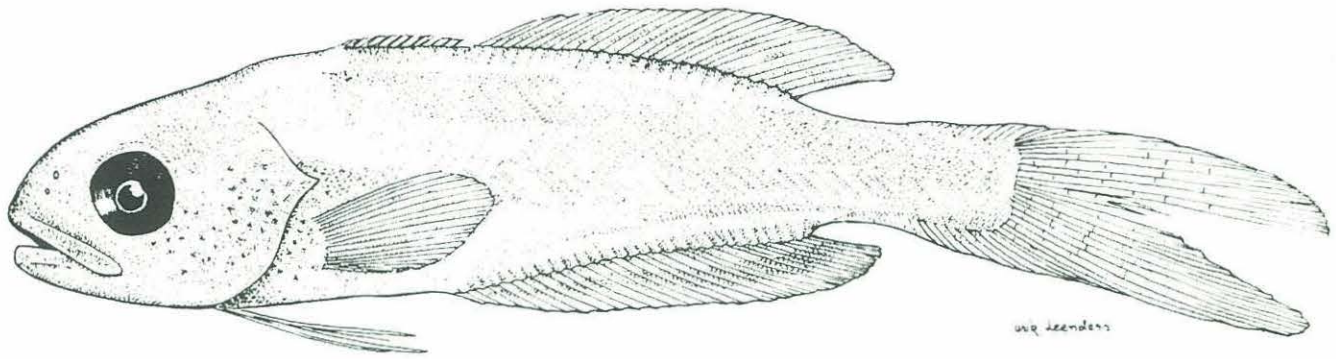
Subsequent to the publication of "The stromateoid fishes . . . . . ", an additional family of stromateoids, the Amarsipidae, was discovered and described - R. L. Haedrich, "A new family of aberrant stromateoid fishes from the equatorial Indo-Pacific", DANA-Report No. 76: 1-14 (1969). The summary states:

> "The possession of a perciform caudal skeleton, teeth uniserial in the jaws, an expanded lacrimal bone, an inflated and protruding top of the head, an extensive sub-dermal canal system, and a bony bridge over the anterior vertical canal of the ear refer a new small pelagic fish to the suborder Stromateoidei. The combination of jugular pelvic fins, teeth on the vomer, six hypural and two epural elements, and a total

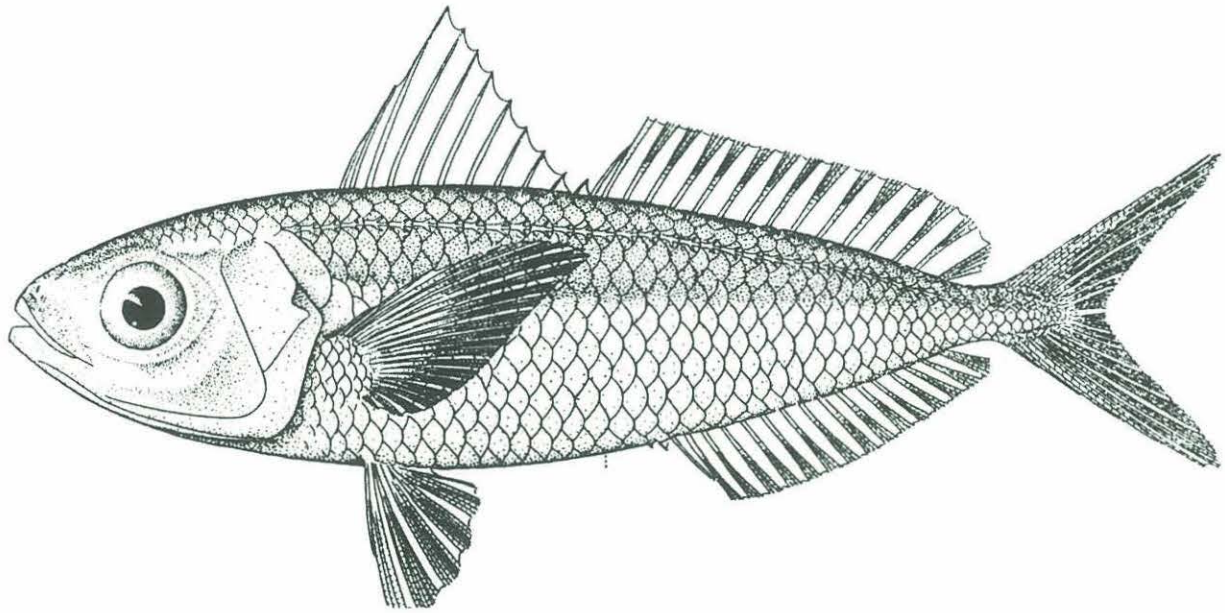
lack of pharyngeal sacs is so distinctive that a new family, the Amarsipidae n. fam., loosely allied with the nomeid line, is required for the fish, *Amarsipus carlsbergi* n. gen., n. sp. About 50 specimens of *Amarsipus*, none of them adult, are known from the equatorial waters of the Pacific and Indian Ocean. Little allometry is apparent in growth from about 10 to 70 mm SL. Almost 90% of the specimens known were taken with less than 400 meters of wire out, suggesting that juvenile *Amarsipus* live probably shallower than 200 m deep in the water column, perhaps in the shallow equatorial current systems."

ILLUSTRATIONS

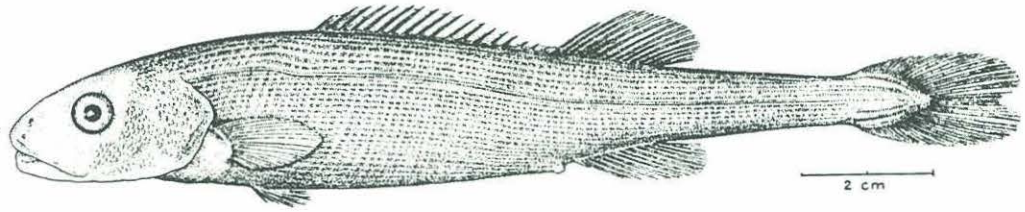
The seven plates which follow show one representative member and general range maps for each genus. The specimens illustrated, compiled from several sources, have not been drawn to scale; instead the standard length (SL) of each is indicated. The range maps are based primarily on our own data.



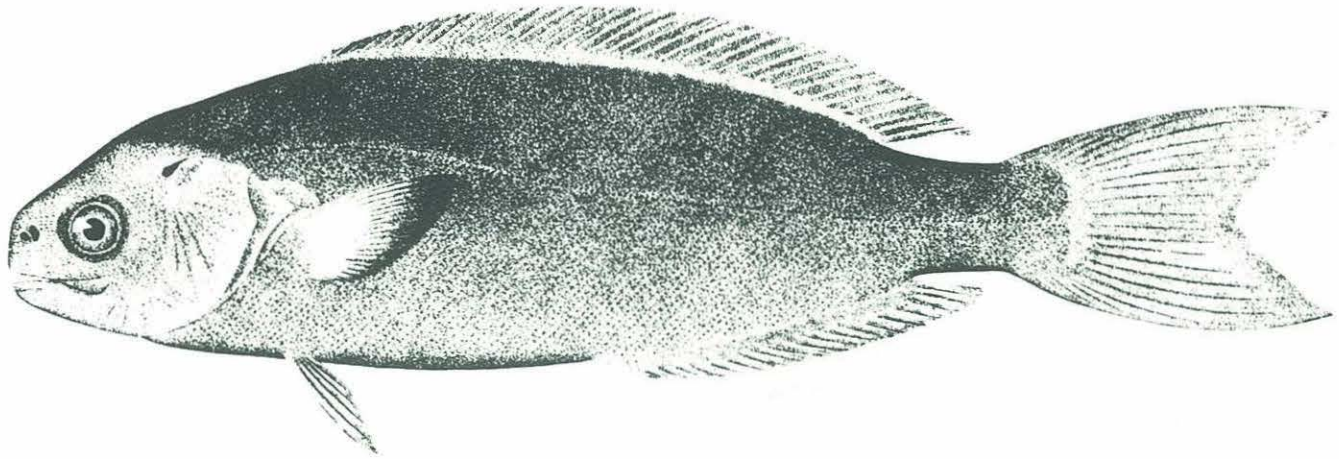
AMARSIPIDAE Amarsipus carlsbergi 56 mm SL



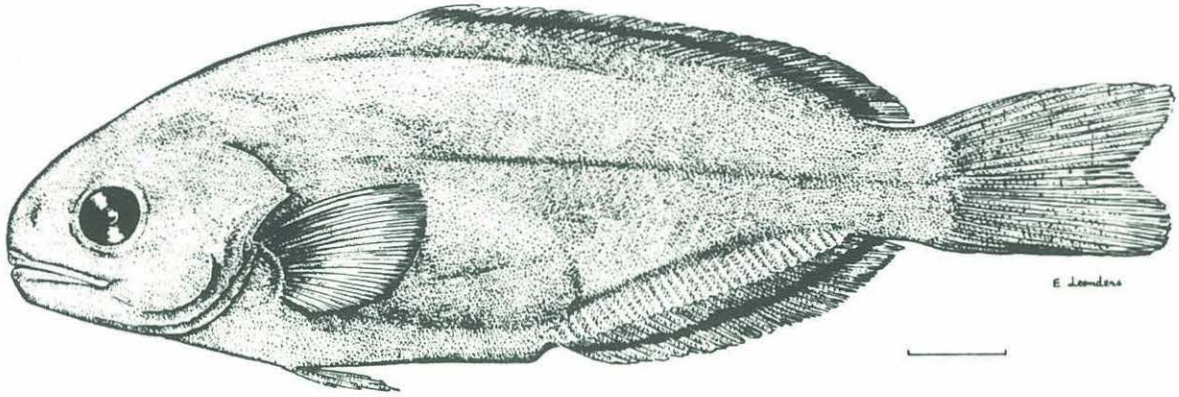
ARIOMMIDAE Ariomma bondi 189 mm SL



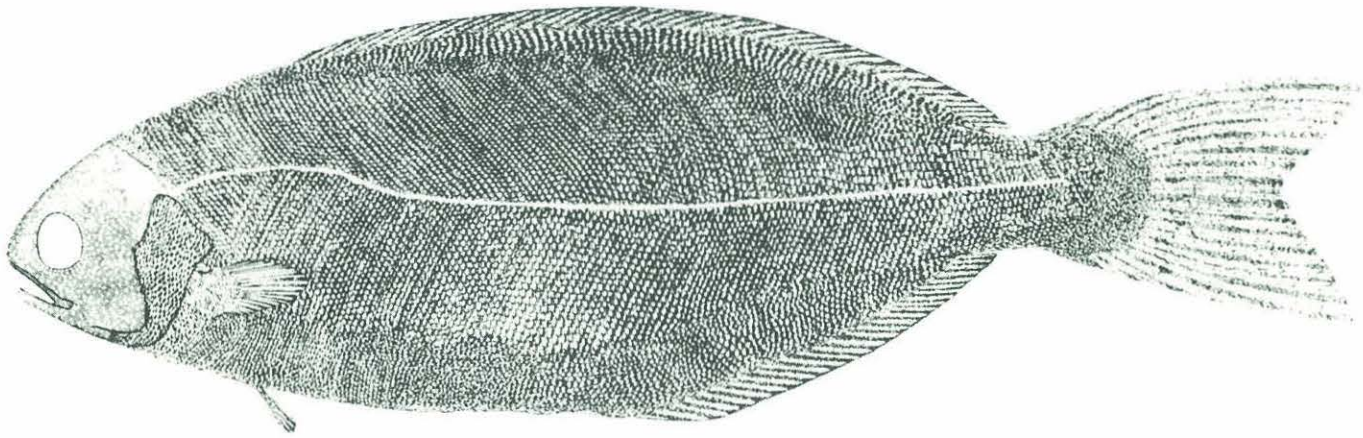
TETRAGONURIDAE Tetragonurus cuvieri 129 mm SL



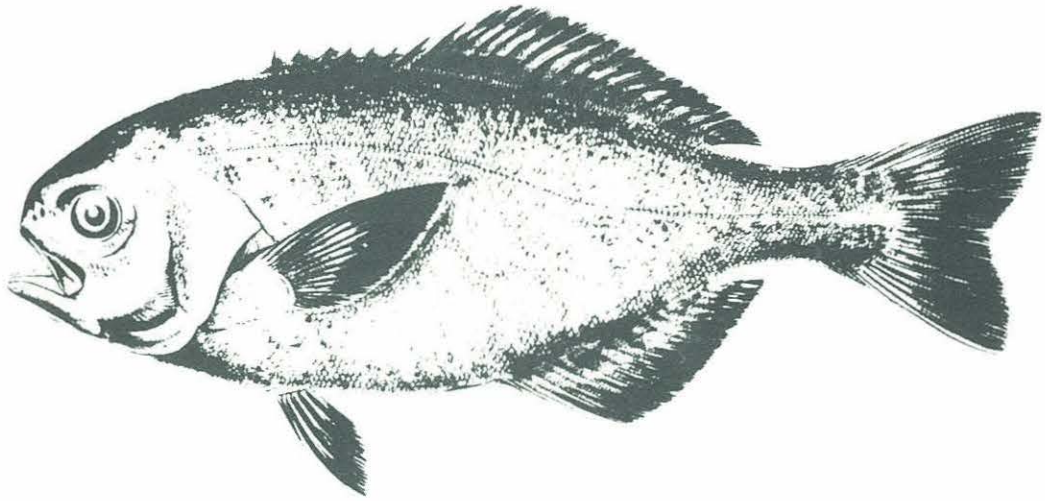
CENTROLOPHIDAE Centrolophus niger 223 mm SL



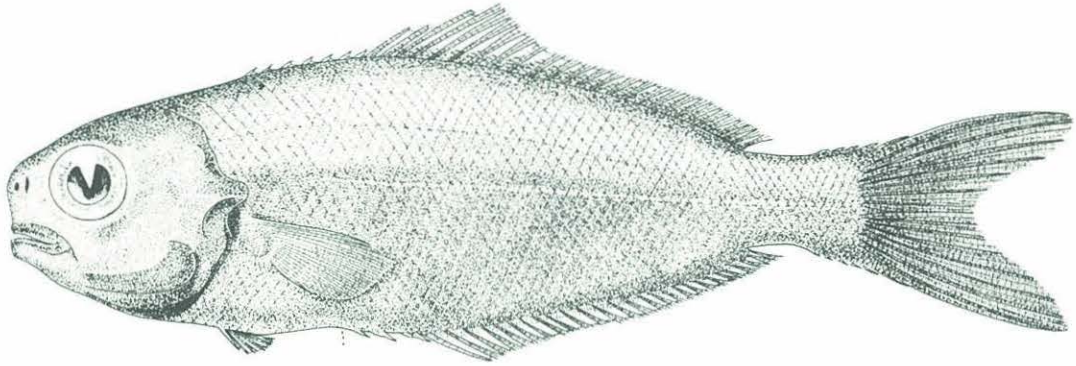
CENTROLOPHIDAE Icichthys lockingtoni 97 mm SL



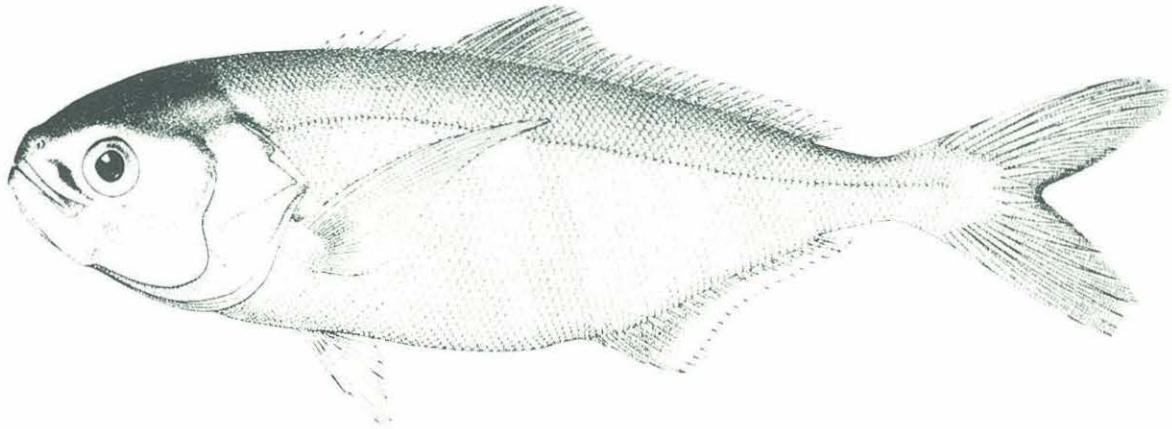
CENTROLOPHIDAE Schedophilus medusophagus 435 mm SL



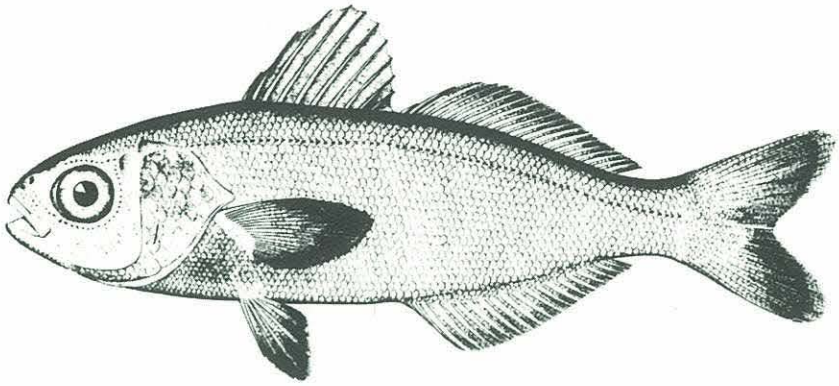
CENTROLOPHIDAE Hyperoglyphe perciforma 200 mm SL



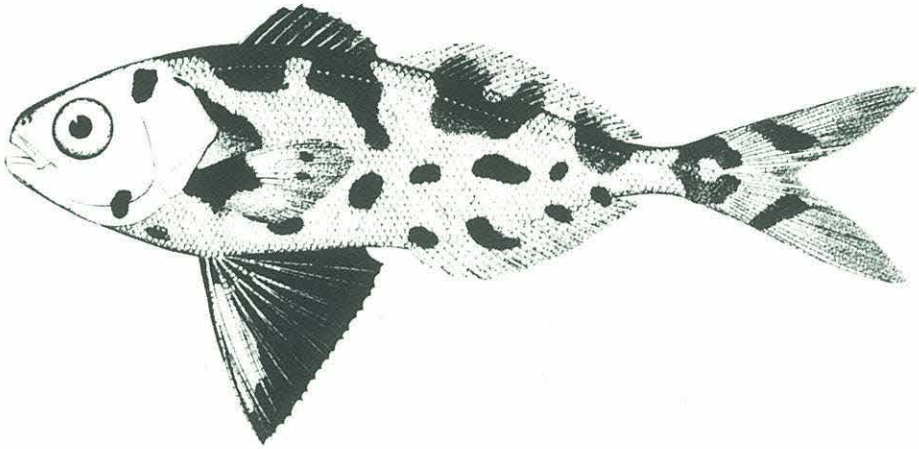
CENTROLOPHIDAE Psenopsis obscura 132 mm SL



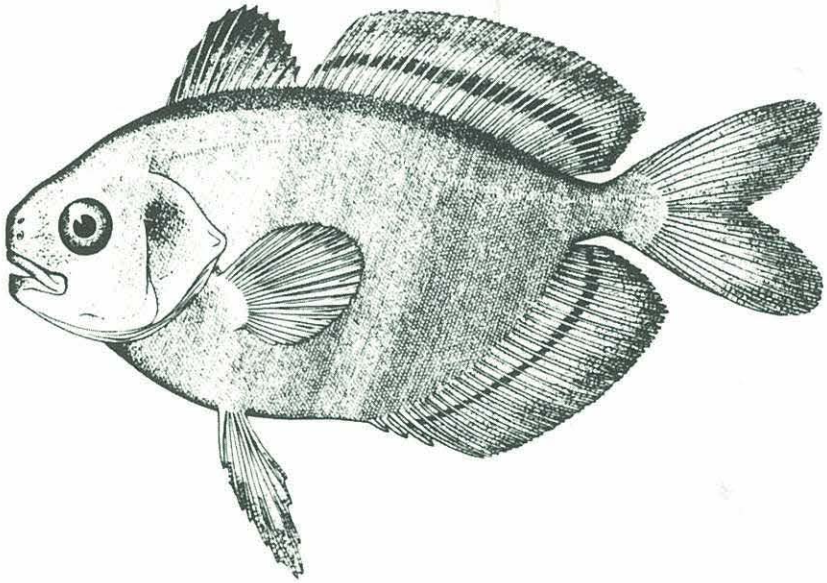
CENTROLOPHIDAE Seriolella violacea 265 mm SL



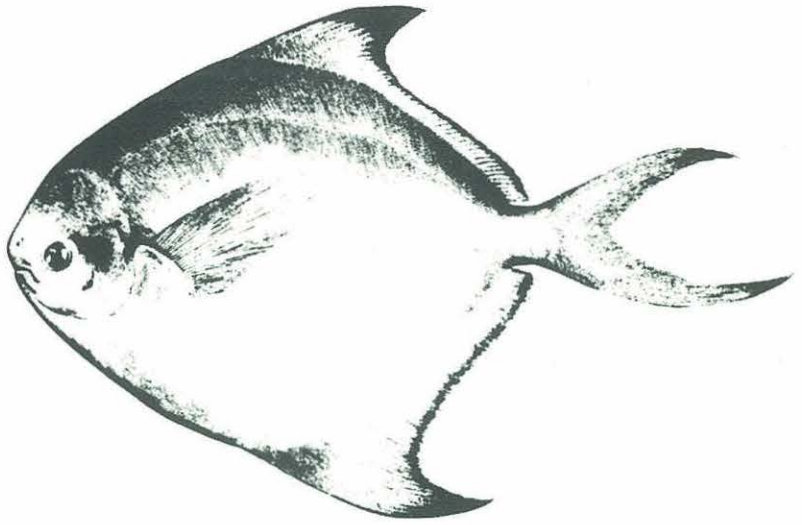
NOMEIDAE Cubiceps sp. 74 mm SL



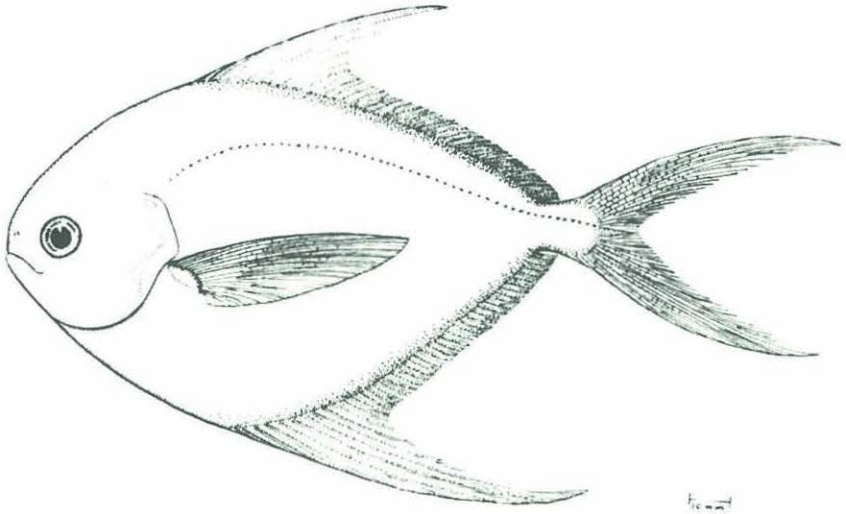
NOMEIDAE Nomeus gronovii 40 mm SL



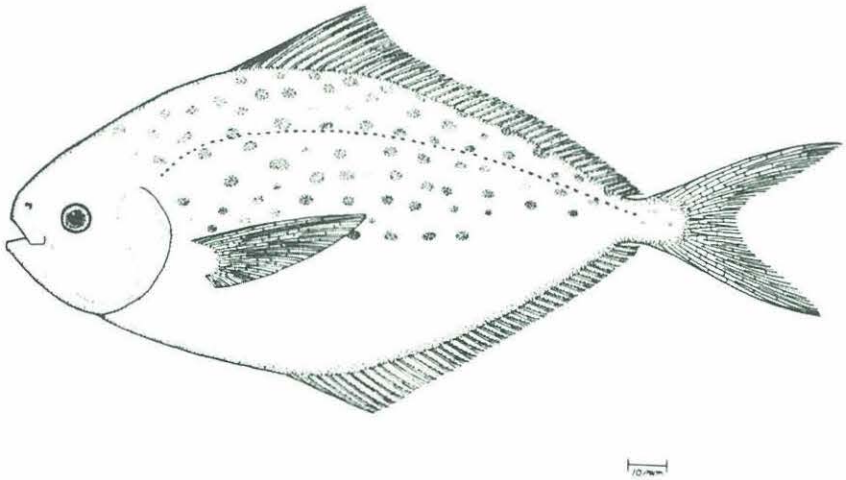
NOMEIDAE Psenes pellucidus 90 mm SL



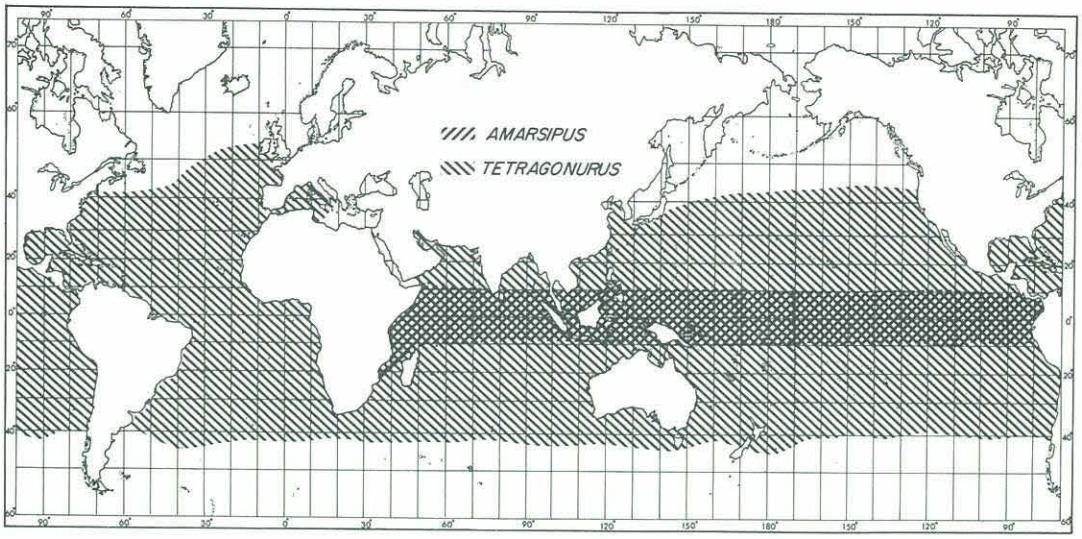
STROMATEIDAE Pampus argenteus 267 mm SL

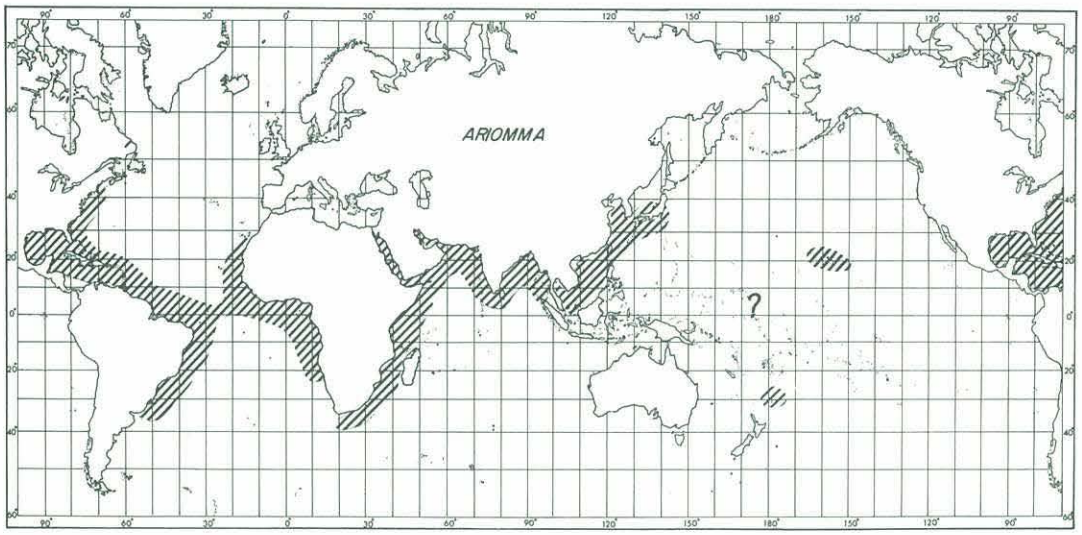


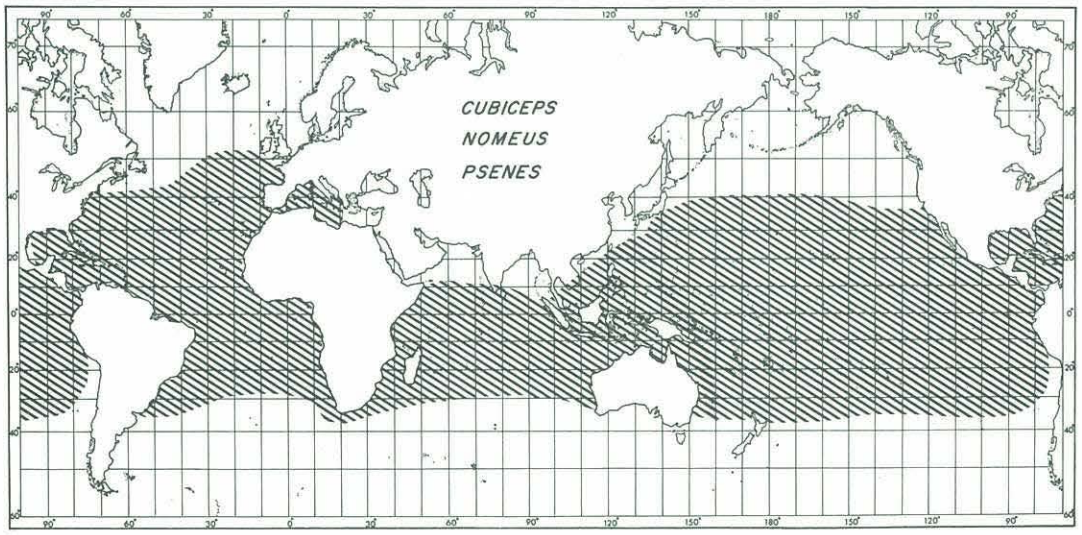
STROMATEIDAE Peprilus medius 141 mm SL

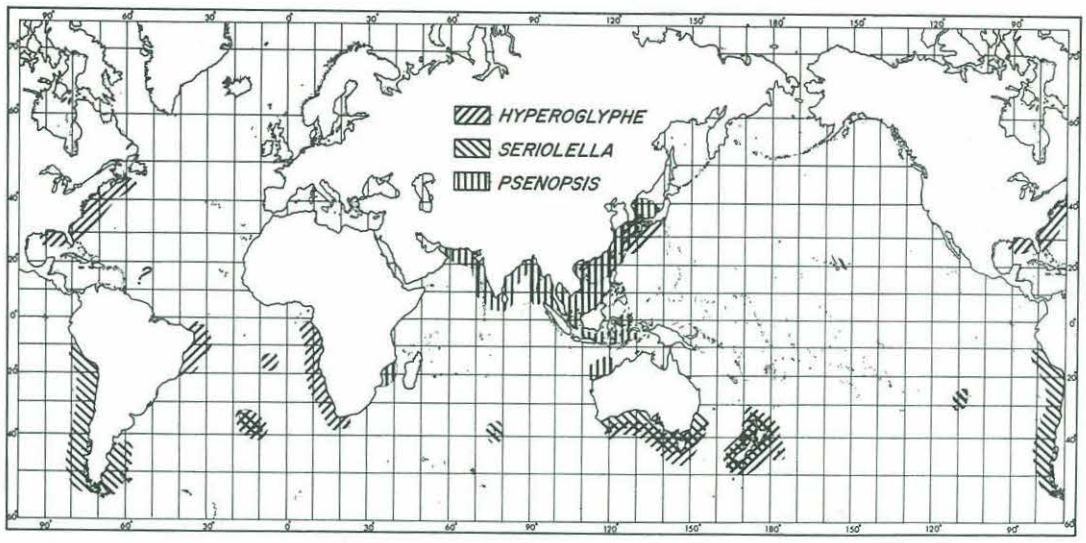


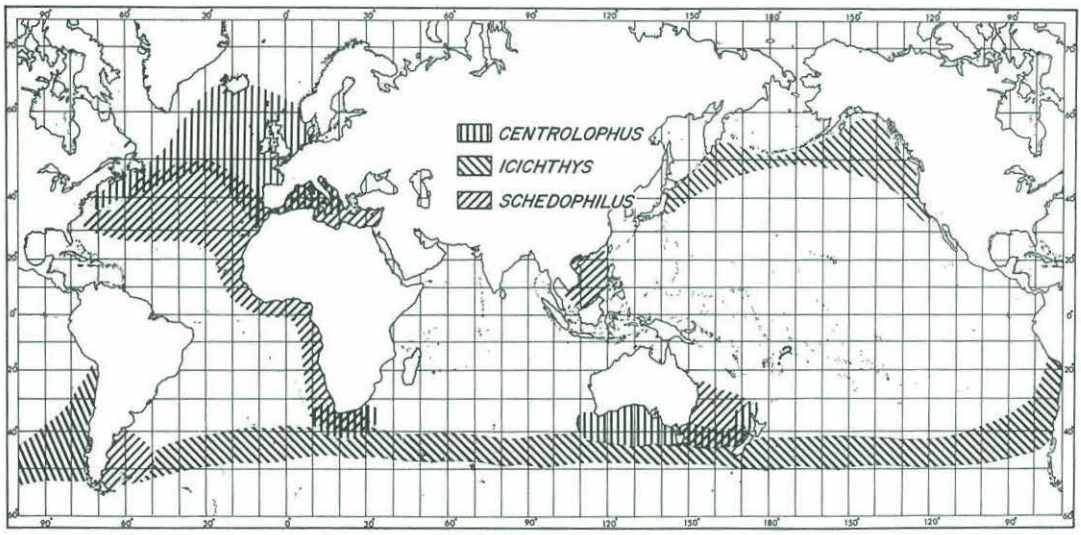
STROMATEIDAE Stromateus stellatus 180 mm SL

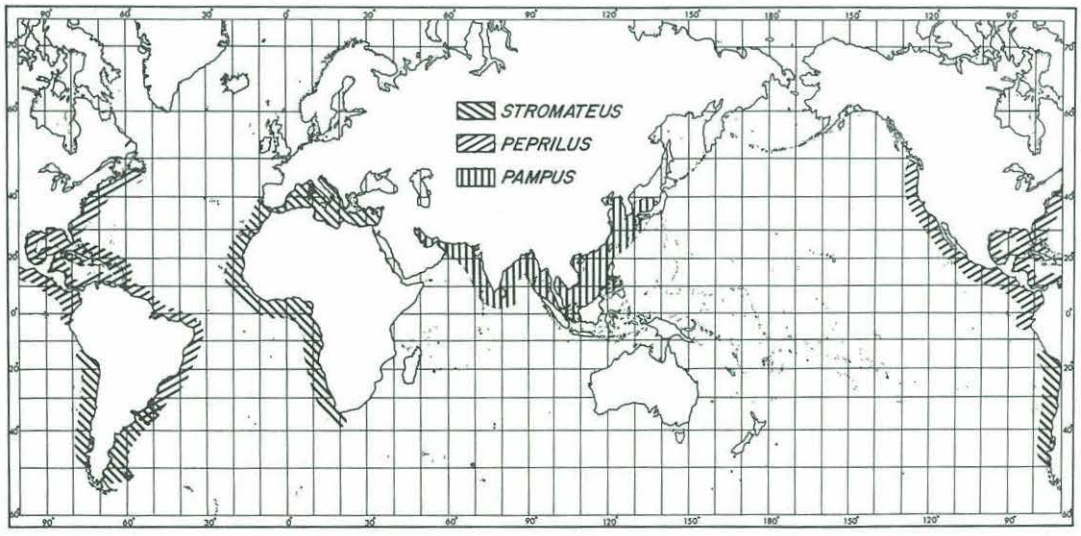

AMARSIPUS
TETRAGONURUS


ARIOMMA
?


CUBICEPS
NOMEUS
PSENES


HYPEROGLYPHE
SERIOLELLA
PSENOPSIS


CENTROLOPHUS
ICICHTHYS
SCHEDOPHILUS


STROMATEUS
PEPRILUS
PAMPUS

Key to Stromateoid Families and Genera

1 (8). Two dorsal fins, distinctly, though scarcely, separated, the first usually with ten to twenty spines; if there are fewer than ten spines, the longest spine is about the same length as the longest dorsal finray. Pelvic fins always present. Vomer, palatines, and basibranchials toothed or not 2

2 (3). Pelvic fins jugular, their origin well before the pectoral fins and under the posterior edge of the preopercle. Body translucent, no color pattern apparent, slender with a deep caudal peduncle. Pharyngeal sacs absent . . . . . .

AMARSIPIDAE
One genus and species,
Amarsipus carlsbergi Haedrich, 1969
Oceanic-tropical parts of the Pacific and Indian Oceans.

D X-XII, 22-27. A 28-32. P 17-19.

Vertebrae 45-47.

3 (2). Pelvic fins thoracic, their origin under the pectoral fins or behind. If the pelvic origin precedes the pectoral insertion, the body has distinct dark blotches on a silvery background; if the body is translucent, it is deep with a slender peduncle. Pharyngeal sacs present. 4

4 (7). The first dorsal fin with about ten long, slender spines, often folded into a groove, the longest spine nearly as long as, or longer than, the longest finray in the second dorsal. Anal finrays 14 to 30. Scales cycloid, thin, deciduous. Fleshy lateral keels on peduncle near caudal fin base absent

or only slightly developed. 29 to 33, 41, or 42 vertebrae . . . 5

5 (6). Vomer, palatines, and usually basibranchials with small, often almost indistinguishable, teeth. Caudal peduncle compressed, its least depth greater than 5% SL, without lateral keels. Usually more than fifteen rays in both the dorsal and anal fins 11

NOMEIDAE
Three genera
Oceanic - all oceans

6 (5). Vomer, palatines, and basibranchials toothless. Caudal peduncle square in cross-section, its least depth less than 5% SL, with two low lateral keels on each side near caudal fin base. Fourteen or fifteen rays (rarely 13 or 16) in both the dorsal and anal fins. . . . . .

ARIOMMIDAE
One genus, *Ariomma*, page 20
Oceanic and coastal - Atlantic, Indian Ocean, Japan, New Zealand, Hawaii

7 (4). The first dorsal fin with ten to twenty short spines, the longest only half the length of the longest finray in the second dorsal. Anal finrays 10 to 16. Scales keeled, heavy, very adherent. Modified scales form two well developed lateral keels on each side of peduncle near caudal fin base. 43 to 58 vertebrae . . . . . .

TETRAGONURIDAE
One genus, *Tetragonurus*, page 45
Oceanic - all oceans

8 (1). A continuous dorsal fin, or two dorsal fins scarcely separated, the first with less than ten spines; if spines are present,

the longest spine is less than half the length of the longest dorsal finray. Pelvic fins present or absent. Vomer, palatines, and basibranchials toothless. 9

9 (10). Pelvic fins always present. None or one to five weak spines, or five to nine stout spines precede dorsal finrays. Anal finrays 15 to 30. Median fins never falcate; their bases rarely the same length. Jaw teeth all conical, simple. Supramaxillary bone usually present, but hard to find in some. Seven branchiostegal rays. 24 to 26 or 50-60 vertebrae 15

CENTROLOPHIDAE
Six genera
Oceanic and coastal - all oceans

10 (9). Pelvic fins never present in adults, rarely present in the young. No stout spines precede dorsal finrays, but, in some species, two to ten small blade-like spines resembling the ends of free interneurals protrude ahead of the fin. Anal finrays 30 to 50. Median fins often falcate; their bases about equal in length. Jaw teeth laterally compressed, either simple or with three to five cusps. No supramaxillary bone. Five to six branchiostegal rays. 30 to 48 vertebrae. 25

STROMATEIDAE
Three genera
Coastal - all oceans

NOMEID Genera

11 (14). Body elongate, maximum depth usually less than 35% SL, greatest in small specimens. Origin of dorsal fin behind, or

directly over in very small specimens, insertion of pectoral fins 12

12 (13). Anal count I-III 14-25. Insertion of pelvic fins under end or behind base of pectoral fin. An oval patch of knob-like teeth on the tongue. 30 to 33 vertebrae . . . . . .

Cubiceps, page 23
Oceanic - all oceans

13 (12). Anal count I-II 24-29. Insertion of pelvic fins before or under insertion of pectoral fin, possibly behind in very large specimens. No patch of teeth on the tongue. 41 vertebrae . . . . . .

Nomeus
One species,
Nomeus gronovii (Gmelin, 1788)
Oceanic - tropical and temperate parts of all oceans

D IX-XII, 24-28. A I-II 24-29.

P 21-23. Vertebrae 41.

14 (11). Body deep, maximum depth usually greater than 40% SL, but possibly less in very large specimens. Origin of dorsal fin before, or directly over in large specimens, insertion of pectoral fins . . . . . .

Psenes, page 16
Oceanic - all oceans

CENTROLOPHID Genera

15 (20). Spines of the dorsal fin weakly developed and all graduating to the dorsal rays 16

16 (19). Weak denticulations on preopercular margin. Origin of dorsal fin usually well behind insertion of pectoral fins, but over

pectoral insertion in very small specimens. Body elongate, maximum depth usually less than 30% SL 17

17 (18). Total elements in anal fin 23 to 27. Scales small, very deciduous, preopercle and cheek naked. Scales along lateral line 160 to 230. Vertebrae 25 . . . . . .

Centrolophus
Oceanic
One, perhaps two, species
Centrolophus niger (Gmelin, 1788)
North Atlantic
Centrolophus maoricus Ogilby, 1893
Southern Ocean

D 37-41. A III 20-23. P 19-22.

Vertebrae 10 + 15.

18 (17). Total elements in anal fin 27 to 31. Scales moderate in size, not especially deciduous, present on preopercle and cheek. Scales in lateral line 100 to 130. Vertebrae 50 to 60. . . . . .

Icichthys, page 28
Oceanic - North Pacific, Southern Ocean

19 (16). Nine to fifteen small spines on preopercular margin. Origin of dorsal fin usually before insertion of pectoral fins, but over pectoral insertion in very large specimens. Body deep, maximum depth usually greater than 35% SL . . . . . .

Schedophilus, page 40
Oceanic and coastal - Atlantic Ocean, Seas of China, Australia/New Zealand

20 (15). Five to nine stout dorsal spines, shorter than and not graduating (graduating slightly in *Psenopsis*) to the dorsal rays 21

21 (22). Dorsal finrays 19 to 25; anal finrays 14 to 21. Preopercular margins spinulose. Scales not especially deciduous. Lateral line arched anteriorly, straightening out over the anal fin. Adipose tissue around eye not well developed. Sclerotic bones not well ossified; golden iris appears as a complete ring . . . . . .

Hyperoglyphe, page 16
Coastal - Western North Atlantic, West Africa, Japan, Southern Ocean

22 (21). Dorsal finrays 25 to 40, anal finrays 18 to 30. Preopercular margin entire or finely denticulate. Scales very deciduous. Lateral line follows dorsal profile. Adipose tissue around eye well developed. Sclerotic bones usually well ossified; golden iris appears divided by a vertical bar 23

23 (24). Insertion of pelvic fins behind insertion of pectorals. Supramaxillary bone present. At least seven more dorsal finrays than anal finrays. Usually eight dorsal spines, the third, fourth and fifth the longest . . . . . .

Seriolella, page 42
Coastal - Pacific South America Australia/ New Zealand

24 (23). Insertion of pelvic fins before or just under insertion of pectorals. Supramaxillary bone absent. Number of dorsal finrays never exceeds number of anal finrays by more than five. Five to seven dorsal spines, increasing in length posteriorly. . . . . .

Psenopsis, page 9
Coastal - Indian Ocean, Northern Australia, Japan

25 (28). Inter- and subopercles not united to the isthmus. End of maxillary before or at anterior border of eye. Cusps on teeth in lower jaw subequal, the teeth appearing truncate to the naked eye. Spine on end of pelvic bone present or absent. In small specimens (less than 100 mm SL) pelvic fins present or absent. Six branchiostegal rays 26

26 (27). One to three flat blade-like spines ahead of median fins. A small spine projecting postero-ventrally from end of pelvic bone. Median fins falcate or not. Pelvic fins never present. 29 to 36 vertebrae . . . . . .

Peprilus, page 31
Coastal - North America, Central America, South America south to Peru and Argentina

27 (26). No flat blade-like spines ahead of median fins. No spine at end of pelvic bone. Median fins never falcate. Pelvic fins absent in adult, but present in some small specimens. 40 to 48 vertebrae . . . . . .

Stromateus, page 43
Coastal - Mediterranean, West Africa, southern South America

28 (25). Inter- and subopercles broadly united to isthmus. End of maxillary under eye. Central cusp on teeth of lower jaw much larger than the other two cusps, which can hardly be seen without extreme magnification. No spine at end of pelvic bone. Pelvic fins never present. Five branchiostegal rays . . . . . .

Pampus, page 30
Coastal - Indian Ocean to Japan

Key to the species in *ARIOMMA*

1 (4). Depth of body greater than 33% SL 2

2 (3). Vertical distance from top of eye to mid-dorsal line contained four or more times in length of head; no distinct spots on sides, only irregular dark blotches or body uniformly brown or bluish-brown . . . . . .

Ariomma indica (Day, 1870)
South Africa, Madagascar, Gulf of Suez, Gulf of Iran to southern Japan including Indonesia and the Philippines

D XI-XII, 14-15. A III 14-15. P 21-23.

Vertebrae 30-31.

3 (2). Vertical distance from top of eye to mid-dorsal line contained 3.7 or fewer times in length of head; irregular dark blotches on sides of juvenile specimens becoming distinct spots smaller than the eye in individuals larger than 100 mm SL . . . . . .

Ariomma regulus (Poey, 1868)
Western Atlantic Ocean north to North Carolina and south to British Guiana including Gulf of Mexico and Caribbean.

D XI-XII, 14-15. A III 14-15. P 21-24.

Vertebrae 30-32.

4 (1). Depth of body less than 28% SL 5

5 (6). Eye large, diameter 32% or greater of length of head. . . . . .

Ariomma lurida Jordan and Snyder, 1904
Hawaii, Japan, New Zealand

D XI-XII, 14-16. A III 13-14. P 20-21.

Vertebrae 32.

6 (5). Eye relatively small, diameter less than 28% of length of head 7

7 (8). Uniform coloration, light brown to brown to bluish-brown . . . . . .

Ariomma evermanni Jordan and Snyder, 1907
Hawaii

Ariomma melana (Ginsburg, 1954)
West equatorial Africa, Caribbean, Gulf of Mexico, and north to Cape Hatteras

D XI-XII, 15. A III 14-15. P 21-25.

Vertebrae 31.

8 (7). Dorsal surface brown to bluish-brown; ventral surface silvery or light in color . . . . . .

Ariomma bondi Fowler, 1930
West equatorial Africa, Caribbean, Gulf of Mexico, north to Cape Cod and south to Buenos Aires

D XI-XII, 14-16. A II-III 15. P 21-22.

Vertebrae 30-31.

We have assumed that : *A. indica* (type locality, Madras) = *A. africana* (Durban) = *A. dollfusi* (Gulf of Suez) = *Psenes extraneous* (Philippines); *A. evermanni* (Hawaii) = *A. thompsoni* (Hawaii); *A. melana* (Mississippi Delta) = *A. multisquamis* (West Africa); *A. bondi* (Grenada, British West Indies) = *A. ledanoisi* (West Africa) = *A. nigriargentea* (Cape Romain, South Carolina). The status of *A. brevimanus* (Klunzinger, 1884), an elongate species described from a single 800 mm specimen from the Red Sea, remains unknown, and we have excluded it from the key.

Some of the systematic problems in this genus have been treated briefly by Haedrich - "First record of *Ariomma* (Pisces, Stromateoidei) from the South Pacific, and comments on the elongate species of the genus." Bull. Mar. Sci. 18(1): 249-260 (1968). The abstract states:

> "Six specimens of *Ariomma* taken by the Danish R/V DANA come from areas where this genus has been recorded. Two fish come from 27°00'S, 177°41'W, far outside the previously known range. These South Pacific specimens are described and referred to *A. lurida* Jordan and Snyder 1904. They extend the known range of the genus into the Australian region, suggesting that at least some species may be more oceanic and independent of the land than was formerly supposed. The three Caribbean specimens are referred to *A. bondi* Fowler 1930; the two from West Africa are indeterminable. A Philippine specimen is deep-bodied, and undoubtedly belongs to *A. indica* (Day, 1870). Despite their wide geographic separation, the elongate South Pacific and North Atlantic specimens are exceedingly similar in both meristics and proportions. A middle-to-late-Pliocene evolution of *Ariomma* combined with the relative uniformity of the oceanic environment could account for the similarity between such widely separated forms. Examination of large series and a search for new characters are needed to solve the problem posed by the species of *Ariomma*."

Key to the species in *CUBICEPS*

1 (8). Anal finrays 18-24, dorsal finrays 19-26. May exceed 20 cm SL 2

2 (3). Pectoral finrays 20-24, vertebrae 33-34 . . . . . .

Cubiceps gracilis (Lowe, 1843)
Eastern Atlantic, Mediterranean, Japan

D IX-XI, I-II 20-22. A II-III 20-23. P 20-24. Vertebrae 15 + 18-19.

3 (2). Pectoral finrays 16-21, vertebrae 31 4

4 (5). Dorsal finrays 24-26, pectoral finrays 16-18 . . . . . .

Cubiceps capensis (Smith, 1850)
South Africa

D IX-X, I-III 24-26. A II 22-23. P 16-18. Vertebrae 14 + 17.

5 (4). Dorsal finrays 19-24, pectoral finrays 18-21 . . . . . .

. 6

6 (7). Dorsal finrays 19-21, anal finrays 18-21, vertebrae 15 + 16.

Cubiceps squamiceps (Lloyd, 1909)
South Africa to Japan

D XI, I-II 19-21. A II-III 18-21. P 18-20. Vertebrae 15 + 16.

7 (6). Dorsal finrays 21-24, anal finrays 21-24, vertebrae 13 + 18.

Cubiceps caeruleus Regan, 1914
Eastern Australia, New Zealand

D X-XI, I-II 21-24. A II-III 21-24. P 19-21. Vertebrae 13 + 18.

8 (1). Anal finrays 14-17, dorsal finrays 14-18. Usually less than 20 cm SL 9

9 (10). Dorsal finrays 16-18, anal finrays 14-17. . . . . .

Cubiceps pauciradiatus Günther, 1872
Central and western Pacific Ocean

D X-XII, I 16-18. A I-II 14-17.

P 18-19. Vertebrae 14 + 17.

10 (9). Dorsal finrays 14-16, anal finrays 14-15 11

11 (12). Vertebrae 13 + 17, gill rakers on lower limb of first arch 14-16 . . . . . .

Cubiceps carinatus Nichols and Murphy, 1944
Eastern tropical Pacific

D IX-X, I 14-16. A II 14-16. P 17-19.

Vertebrae 13 + 17.

12 (11). Vertebrae 13 + 18, gill rakers on lower limb of first arch 16-17 . . . . . .

Cubiceps athenae Haedrich, 1965
Western North Atlantic

D X-XI, I 15-16. A II 14-15. P 18-19.

Vertebrae 13 + 18.

? *Cubiceps longimanus* Fowler, 1934
South Africa

D X-XI, I 15-16. A I-II 15. P 18-20. Vertebrae ? Gill rakers on lower limb 14-15.

Cubiceps is one of the most poorly known stromateoid genera. Some helpful papers which lead to other references are: T. Abe, "Notes on the adult of *Cubiceps gracilis* from the western Pacific",

J. Oceanogr. Soc. Japan, 11 (2): 75-80 (1955). -T. Abe, "On the presence of at least two species of *Cubiceps* (Nomeidae, Pisces) in the path of the "Kuro - shiwo" ", Rec. Oceanogr. Works Japan, spec. no. 3:225-229 (1959). - R.L. Haedrich, "*Cubiceps athenae*, a new nomeid fish from the western North Atlantic, and its systematic position among stromateoids", Copeia 1965 (4): 501-505 (1965).

Key to the species in *HYPEROGLYPHE*

1 (2). Dorsal finrays 19-21, anal finrays 15-17, lateral line scales 89-95 . . . . . .

Hyperoglyphe antarctica (Carmichael, 1818)
Southern Ocean

Hyperoglyphe perciforma (Mitchill, 1818)
Atlantic Ocean, Florida to Nova Scotia

D VII-VIII, 19-21. A III 15-17. P 18-22. Vertebrae 10 + 15.

2 (1). Dorsal finrays 22-26, anal finrays 16-20, lateral line scales less than 89 or more than 95 3

3 (6). Lateral line scales less than 89 4

4 (5). Anal finrays 16-17, lateral line scales around 87 . . . . . .

Hyperoglyphe bythites (Ginsburg, 1954)
Gulf of Mexico

D VII-VIII, 22-25. A III 16-17. P 20-21. Vertebrae 10 + 15.

5 (4). Anal finrays 18-20, lateral line scales around 75 (?) . . . . . .

Hyperoglyphe moselii (Cunningham, 1910)
Gulf of Guinea to South Africa, St. Helena

D VI, 23-25. A III 18-20. P 20-22. Vertebrae 10 + 15.

6 (3). Lateral line scales more than 95 7

7 (8). Dorsal VIII, 22-24. Anal III 17-19. Pectoral 21-23. Lateral line scales 99-103. . . . . .

Hyperoglyphe japonica (Doderlein, 1885)
Japan

8 (7). Dorsal VII, 26. Anal III 20. Pectoral 20. Lateral line scales around 110 . . . . . .

Hyperoglyphe macrophthalma (Miranda-Ribeiro, 1915)
Brazil

Key to the species in *ICICHTHYS*

1 (4). Vertebrae 50-60. Origin of dorsal fin well behind pectoral fin base. Dorsal fin base 39-53% SL; anal fin base 25-33% SL; maximum depth 19-42% SL 2

2 (3). Vertebrae 56-60. Pectoral 18-21. No prominent pores on the head. Pyloric caeca about 10, digitiform. Dorsal 39-45; anal 27-32. . . . . .

Icichthys lockingtoni Jordan and Gilbert, 1880
North Pacific

3 (2). Vertebrae 50-51. Pectoral 16-17. About seven large lipped pores on each side of the head above the eye and opercles. Pyloric caeca numerous, dendritic. Dorsal 35-42; anal 25-28. . .

Icichthys australis Haedrich, 1966
Southern Ocean

4 (1). Vertebrae 46. Origin of dorsal fin over pectoral fin base. Dorsal fin base 62% SL; anal fin base 42% SL; maximum depth 45% SL. Dorsal IV 44; anal III 32; pectoral 19 . . . . . .

Tubbia tasmanica Whitley, 1943
Known only from Tasmania, a single specimen 73 mm SL

Tubbia was considered by Haedrich (1967 - "The stromateoid fishes . . .", page 39) to be a synonym of *Schedophilus*. Examination of the type shows that this is probably not so. *Tubbia*, displaying characters intermediate between *Schedophilus* and *Icichthys*, remains an enigma.

Icichthys has been treated recently by Haedrich - "The stromateoid fish genus *Icichthys*: notes and a new species", Vidensk. Medd. fra Dansk Naturh. Foren., 129: 199-213 (1966). An abstract follows:

"A new species of *Icichthys*, based on a single specimen from east of New Zealand, differs from the North Pacific *I. lockingtoni* in having fewer pectoral finrays (16 vs. 18-21) and vertebrae (51 vs. 56-60), and in having three epural elements in the caudal skeleton instead of two. The structure of the caudal skeleton of the new species suggests a close relationship of *Icichthys* to *Centrolophus*. The two genera probably stem from a common widespread ancestor. Today both are bipolar in distribution. *Centrolophus* in the Atlantic, *Icichthys* in the Pacific. *Icichthys lockingtoni* prefers cool waters and associates with medusae near the surface when young, descending to deeper layers with growth. Euphausiids and siphonophore tissue were found in stomach contents. Spawning occurs from winter into spring. Allometry is negative in all proportions investigated."

Key to the species in *PAMPUS*

1 (4). Median fins falcate and preceded by five to 10 flat, blade-like spines; vertebrae 14-16 + 20-26 2

2 (3). Gill rakers 2-3 + 8-10; dorsal finray formula V-X 38-43; anal finray formula V-VII 34-43; vertebrae 14-16 + 20-25; about 600 slender pyloric caeca . . . . . .

Pampus argenteus (Euphrasen, 1788)
Iranian Gulf to Japan

3 (2). Gill rakers 3-6 + 12-15; dorsal finray formula VIII-X 42-49; anal finray formula V-VII 42-47; vertebrae 14-15 + 24-26; pyloric caeca relatively thick and much fewer than 600 in number . . . . . .

Pampus echinogaster (Basilewsky, 1855)
China, Korea, and Japan

4 (1). Median fins not falcate, but finrays gradually diminish in length posteriorly; no spines preceding the median fins; vertebrae 14 + 19. . . . . .

Pampus chinensis (Euphrasen, 1788)
India to China

Parts of this key are based on T. Abe and T. Kosakai - "Notes on an economically important but scientifically little-known silver pomfret, *Pampus echinogaster* (Pampidae, Teleostei)", Jap. J. Ichthyol. XII (1/2): 29-31(1964).

Key to the species in *PEPRILUS*

1 (2). Row of about 17 to 25 relatively large pores immediately below anterior half of dorsal fin; premaxillary teeth usually with three small cusps 2

2 (1). No row of pores below anterior half of dorsal fin; premaxillary teeth pointed, simple 5

3 (4). Body elongate, shallow to moderately deep, 36-60% SL; eye moderately large, 6-13% SL; caudal vertebrae 17 to 20, usually 19, rarely 17 or 20; dorsal and upper ventral surfaces in adults often mottled with dark spots . . . . . .

Peprilus triacanthus (Peck, 1804)
Atlantic Ocean - southern Newfoundland to Florida

D II-IV 40-48. A II-III 37-44. P 17-22. Vertebrae 30-33.

4 (3). Body moderately elongate, moderately deep to deep, 46-64% SL; eye large, 7-14% SL; caudal vertebrae 16 to 18, usually 17; dorsal or upper ventral surface rarely if ever mottled. .

Peprilus burti Fowler, 1944
Gulf of Mexico

D II-IV 38-48. A II-III 35-43. P 19-23. Vertebrae 29-31.

5 (6). Dorsal and anal fins except in larvae and juveniles smaller than 50 to 75 mm SL moderately to extremely falcate, the longest anal ray six or more times the length of the shortest

anal ray; dorsal often slightly less falcate 7

6 (5). Dorsal and anal fins only slightly falcate, the longest dorsal and anal rays less than six times the length of the shortest of each 9

7 (8). Body ovate, very deep, 57-88% SL; dorsal rays 38 to 47, usually 41 to 45; gill rakers 20 to 23, usually 21 or 22; caudal vertebrae 16 to 18, usually 17 . . . . . .

. . . . . .

Peprilus paru (Linnaeus, 1758)
Atlantic - New York to Argentina, including Gulf of Mexico and Caribbean

D II-IV 38-47. A II-III 35-45. P 18-24. Vertebrae 29-31.

8 (7). Body moderately elongate, moderately deep to deep, 46-62% SL; dorsal rays 42 to 51, usually 45 to 48; gill rakers 23-27, usually 24 to 26; caudal vertebrae 20 to 22, usually 21. .

. . . . . .

Peprilus medius (Peters, 1869)
Pacific Ocean - southern Gulf of California to northern Peru

D III-IV 42-51. A III-IV 40-47. P 20-24. Vertebrae 33-35.

9 (10). Body ovate, deep, 54-68% SL; eye moderately large, 8-12% SL; snout length considerably less than eye diameter, 5-7% SL; dorsal spines 3 or 4, most frequently 4; often a series of irregularly-spaced, medium sized pores visible along dorsal surface; total vertebrae 31-33, usually 32 . . . . . .

Peprilus ovatus Horn, MS in press
Northern Gulf of California

D III-IV 40-46. A III-IV 40-46. P 19-23. Vertebrae 31-33.

10 (9). Body elongate, shallow to moderately deep, 37-52% SL; eye small, 5-12% SL; snout length about equal to eye diameter, 6-8% SL; dorsal spines 2 to 4, usually 3; no series of medium-sized pores usually visible along dorsal surface; total vertebrae 30, 31, or 36 11

11 (12). Dorsal rays 43 to 49, usually 45 to 48; anal rays 40 to 44; caudal vertebrae 21 or 22, usually 21; total vertebrae 36 . . . . . .

Peprilus snyderi Gilbert and Starks 1904
Gulf of California and outer Baja California to Panama

D II-III 43-49. A II-III 40-44.

P 21-23. Vertebrae 36.

12 (11). Dorsal rays 41 to 48, usually 43 to 47; anal rays 35 to 44, usually 38 to 41; caudal vertebrae 17 or 18, usually 17; total vertebrae 30 or 31. . . . . .

Peprilus simillimus (Ayres, 1860)
Southern British Columbia to southern Baja California

D II-IV 41-48. A II-III 35-44. P 19-23. Vertebrae 30-31.

A revision and study of certain aspects of the biology of this genus have recently been completed by Horn- "Systematics and biology of the stromateid fishes of the genus *Peprilus*." Bull. Mus. Comp. Zool., Harvard (In Press). The summary states:

> "A complete revision is presented of the genus *Peprilus*, one of the three genera of the family Stromateidae. The nominal genera *Poronotus* and *Palometa* are placed in the synonymy of *Peprilus*. Seven species are recognized in the genus. *P. ovatus* is described as a new species and is apparently restricted

to the northern Gulf of California. *P. medius* and *P. palometa* are synonyms, and the former is the valid name. *P. alepidotus* is treated as a synonym of *P. paru*. Accounts of each species consist of a synonymy, diagnosis, description, distribution, the geographic variation, and the ontogenetic change.

"The genus *Peprilus* occurs in tropical and temperate waters along the coasts of North, Central, and northern South America. Four species *P. medius*, *P. ovatus*, *P. simillimus*, and *P. snyderi*, are distributed along the Pacific Coast, and three, *P. triacanthus*, *P. burti*, and *P. paru*, along the Atlantic Coast.

"Several aspects of functional morphology are considered. The vertebral column, skull, and pectoral fins appear to ossify earlier than the caudal skeleton and median fins, a sequence interpreted as being correlated with an early planktonic life followed by an independent nektonic existence. Vertebral number is relatively constant within a species and is considered to be of possible selective value in maintaining a certain body form. The absence of pelvic fins, the long pectoral fins which are used extensively for propulsion in adult fishes, and the compressed body may all be correlated with the continuous swimming habit of these fishes, especially those larger than 100 mm SL. An hypothesis is presented that the swimbladder is of hydrostatic advantage to juvenile fishes which hover under jellyfish medusae and that it becomes nonfunctional in larger fishes which swim continuously. The scales are highly deciduous, and the skin is underlain by an extensive canal system the function of which is unknown. The alimentary canal is composed of a small mouth with nipping teeth, a toothed, muscular pharyngeal sac, a U-shaped stomach, numerous pyloric caeca, and a long intestine. The food is shredded in the pharyngeal sac, and the great absorptive area of the caeca and intestine probably allows for maximum utilization of jellyfish and other food items.

"Considerations of life history and ecology are generally of four species - *P. triacanthus*, *P. burti*, *P. Paru*, and *P. simillimus*. Spawning occurs in the pelagic surface layers at varying distances from shore. The eggs and larvae are planktonic, the latter becoming capable of independent locomotion at a size of about 10 mm SL. The species occur in a wide range of salinity and variously inhabit all depths over the continental shelf and generally over a sand or mud bottom. The genus is essentially tropical and warm temperate, only two species, *P. triacanthus* and *P. simillimus*, reaching cooler waters. Seasonal movements appear to be most pronounced in *P. triacanthus*, the species occurring most abundantly in temperate regions. Fishes smaller than 100 mm SL associate with jellyfish medusae of several genera. This association is apparently important during the early critical growth phases of the fishes. *Peprilus* is a low level carnivore; jellyfish

medusae seem to be an important element in the diet, especially of juveniles. Other food items include a variety of small crustaceans, polychaete worms, and small fishes. Fishes of the genus are evidently significant forage fishes for a number of larger fishes, some of which are of great commercial importance. The economically important species of *Peprilus* are generally taken commercially in a region much smaller than the total range of the species, and this seems to reflect the pattern of migration and center of abundance of the particular species.

"Disruption of the Tethys Sea in the Miocene apparently facilitated the segregation of the early members of the family Stromateidae and led to the evolution of the three extant and essentially allopatric genera. The formation of the Central American land bridge in the Pliocene, the emergence and submergence of land areas associated with the Pleistocene glacial and interglacial periods, and the prevailing current systems all appear to have been important in producing the current level of differentiation and speciation in the genus.

"The elongate *P. snyderi* is considered to be the most primitive type and the deep-bodied *P. paru* the most highly derived form in the genus. The Camin-Sokal method for deducing relationships of contemporaneous species is used to reconstruct a dendrogram of species relationships. Two somewhat subtle species groups are recognized in the genus, and each group is represented on both sides of the Central American isthmus. Character displacement is invoked as a possible mechanism to explain the existence of two apparently distinct populations of *P. triacanthus* in the Atlantic off the southeastern coast of the United States.

"The distributions of the species of *Peprilus* appear to correspond generally to the major faunal provinces of the Atlantic Coast and the Pacific Coast of the Americas. The species generally traverse the zoogeographic subdivisions established from the study of small fishes inhabiting rocky shores. Sympatry involves the more diverse species, and the similar or closely related species tend to parallel one another in different oceans or displace one another latitudinally along a continuous coastline. Niche separation seems to be produced largely by spatial arrangement and ecological displacement."

Key to the species in *PSENES*

1 (8). Teeth in lowerjaw long, knife-like, compressed, close-set, very different from those in the upper jaw. Length of pelvic fin 16-52% SL. Maximum depth 29-69% SL. Vertebrae 31-42 2

2 (3). Elements in the second dorsal 27-32; elements in anal 28-34. Musculature very soft, bases of median fins translucent. Banded color pattern in the young, but becoming uniform brown with growth. Vertebrae 41-42. . . . . .

Psenes pellucidus Lütken, 1880
Atlantic, Northwestern Pacific, Indian Oceans

D IX-XII, I-II 27-32. A III 26-31. P 18-20. Vertebrae 15 + 26-27.

3 (2). Elements in second dorsal 22-24; elements in anal 21-27. Musculature not particularly soft; bases of median fins not translucent. Marked banded or mottled color pattern. Vertebrae 31-38 4

4 (7). Body elongate, maximum depth 29-42% SL. Anal finrays 22-24. Pectoral finrays 21-23. Lateral line scales 70-80. Vertebrae 35-38. 5

5 (6). Preanal distance 51-54% SL. Length of pectoral fin 23-27% SL. Anal spines II. Pectoral finrays 19. Vertebrae 36-38. . . . . .

Psenes sio Haedrich,
Eastern Tropical Pacific

D X-XII, 23-25. A II 23-24. P 19. Vertebrae 15 + 21-23.

6 (5). Preanal distance 58-63% SL. Length of pectoral fin 30-34% SL. Anal spines III. Pectoral finrays 21-23. Vertebrae 35. . . . . .

Psenes maculatus Lütken, 1880
Biantitropical in Atlantic Ocean

D IX-XI, I 22-24. A III 21-23. P 20-22. Vertebrae 15 + 20.

7 (4). Body deep, maximum depth 42-69% SL. Anal finrays 18-22. Pectoral finrays 18-22. Lateral line scales 50-60. Vertebrae 31 . . . . . .

Psenes arafurensis Günther, 1889
Tropical Atlantic, Indian Oceans

D X-XI, I-II 19-21. A III 20-21. P 18-20. Vertebrae 13 + 18.

8 (1). Teeth in lower jaw round in cross-section, neither long, knife-like, nor close-set, similar to those in the upper jaw. Length of pelvic fin 9-27% SL. Maximum depth 34-58% SL. Vertebrae 31-32 9

9 (10). Elements in the second dorsal 24-28; elements in anal 27-31. Fine horizontal lines along sides. Maximum depth 44-52% SL. Vertebrae 31. . . . . .

Psenes cyanophrys Cuvier and Valenciennes, 1833
Circumtropical

D IX-XI, 24-28. A III 24-28. P 17-20. Vertebrae 13 + 18.

10 (9). Elements in the second dorsal 17-20; elements in anal 20-21. Color pattern either vertically banded or clear. Maximum depth 36-46% SL. Vertebrae 31-32 . . . . . .

Psenes whiteleggii Waite, 1894
Indian Ocean, Australia

D XI, 17-20. A III 17-18. P 18-20.

Vertebrae 13 + 18-19.

This key is from a manuscript in preparation by R. L. Haedrich.

Key to the species in *PSENOPSIS*

1 (2). Deep-bodied, maximum depth usually 40-55% SL. Pectoral finrays 20-23, dorsal finrays 27-32, anal finrays 25-29 . . . . . .

Psenopsis anomala (Temminck and Schlegel, 1850)
Japan

Psenopsis humerosa Munro, 1958
Dampier Archipelago, northeastern Australia

D V-VII 27-32. A III 25-29. P 20-23.

Vertebrae 10 + 15.

2 (1). Elongate, maximum depth usually 25-40% SL. Pectoral finrays 16-20, dorsal finrays 26-29, anal finrays 21-27 3

3 (4). Anal elements III-IV 21-23. Eye diameter 18-21% of head length . . . . . .

Psenopsis cyanea (Alcock, 1890)
Coasts of India

D VI-VII 26-28. A III-IV 21-23.

P 16-20. Vertebrae 10 + 15.

4 (3). Anal elements II-III 25-27. Eye diameter 27-29% of head length . . . . . .

Psenopsis obscura Haedrich, 1967
Indonesia to South Africa in deep water

D V-VII 26-29. A II-III 25-28. P 18-20.

Vertebrae 10 + 15.

The species of *Psenopsis* have been discussed by R. L. Haedrich -"A new species of *Psenopsis* (Stromateoidei, Centrolophidae) from Indo-Malayan seas", Jap. J. Ichthyol. XIV (4/6): 187-196(1967). This key is based in part on that paper.

Key to the species in *SCHEDOPHILUS*

1 (4). More than 43 elements in the dorsal fin, more than 27 in the anal. Body very soft and limp, spines in the median fins very weak. Gill rakers on the lower limb of the first arch less than 13 2

2 (3). Dorsal of 44-50 elements, anal 28-31; vertebrae 10 + 15 . . . . . .

Schedophilus medusophagus Cocco, 1838
North Atlantic, Southern Pacific?

D 44-50. A 28-31. P 18-21. Vertebrae 10 + 15.

3 (2). Dorsal of 56-60 elements, anal 34-41; vertebrae 12 + 18-19 . . . . . .

Schedophilus huttoni (Waite, 1910)
Southern Ocean

D 56-60. A 34-41. P 19-20. Vertebrae 12 + 18-19.

4 (1). Less than 41 elements in the dorsal fin, less than 28 in the anal. Body usually firm, spines in median fins often quite strong. Gill rakers on lower limb of the first arch more than 12. 5

5 (6). Dorsal V-VII 23-36, anal III 16-18 . . . . . .

Schedophilus pemarco (Poll, 1959)
West Africa

D V-VIII 23-26. A III 16-18. P 19-22. Vertebrae 10 + 15.

6 (5). Dorsal IV-VIII 31-34, anal III 20-25 7

7 (8). Pectoral finrays 21-22, gill rakers on lower limb of the first arch 16. Scales large, body very firm. Free interneurals 2 . . . . . .

Schedophilus ovalis (Cuvier and Valenciennes, 1833)
Mediterranean, Eastern Atlantic, Australia

D VI-VIII 31-32. A III 20-24. P 21-22.

Vertebrae 10 + 15.

8 (7). Pectoral finrays 19-21, gill rakers on lower limb of the first arch 13-14. Scales small, body not particularly firm. Free interneurals 3 9

9 (10). Anal III 20-21, vertebrae 10 + 16. Body horizontally banded . . . . . .

Schedophilus griseolineatus (Norman, 1937)
Southwestern Atlantic

D VI-VIII 31-33. A III 20-21. P 19-21.

Vertebrae 10 + 16.

10 (9). Anal III 24, vertebrae 12 + 17. Body vertically banded . . . . . .

Schedophilus maculatus Günther, 1860
Indian Ocean, Australia

D VIII-IX 27-29. A III 23-25. P 19-21.

Vertebrae 12 + 17.

See also the Key to *ICICHTHYS*, page 28, where *Tubbia tasmania*, an intermediate form, is included. The key to *Schedophilus* is from a manuscript in preparation by R. L. Haedrich.

Key to the species in *SERIOLELLA*

1 (2). Dorsal finrays 25-28. Anal finrays 18-20. Gill rakers on lower limb of first arch 16-18. Vertebrae 11 + 14 . . . . . .

Seriolella violacea Guichenot, 1848
Southern Australia and New Zealand

D VI-VIII, 25-28. A III 18-20. P 21-22. Vertebrae 11 + 14.

2 (1). Dorsal finrays 26-39. Anal finrays 21-24. Gill rakers on lower limb of first arch 14-16. Vertebrae 10 + 15 3

3 (4). Deep-bodied, maximum depth greater than 30% SL. Dorsal finrays 26-33. . . . . .

Seriolella brama (Günther, 1860)
Southern Australia and New Zealand

D VI-VIII, 26-33. A III 21-23. P 20-21. Vertebrae 10 + 15.

4 (3). Elongate, maximum depth less than 30%SL. Dorsal finrays 34-39 . . . . . .

Seriolella punctata (Bloch and Schneider, 1801)
Southern Australia and New Zealand

Seriolella porosa Guichenot, 1848
Peru and Chile

D VI-VII, 34-39. A III 21-24. P 19-22. Vertebrae 10 + 15.

Not included in this key, because of their uncertain status, are *Seriolella velaini* Sauvage, 1879, Isle St. Paul, Indian Ocean, and *Seriolella christopherseni* Sivertsen, 1945, Tristan da Cunha, Atlantic Ocean.

Key to the species in *STROMATEUS*

1 (2). Vertical bars on the sides and pelvic fins present in individuals of usually less than 100 mm SL; 33-37 total anal fin elements; 21-25 pectoral finrays; no dark spots on sides . . . . . .

Stromateus fiatola Linnaeus, 1758
Mediterranean Sea; West Africa south to Cape Town

D V? 42-45. A II-III 32-36. P 21-25.

Vertebrae 18-19 + 25-26.

2 (1). Vertical bars and pelvic fins never present; 38-46 total anal fin elements; 19-23 pectoral finrays; dark spots along upper sides of fishes larger than about 50 mm SL, the number generally increasing with size . . . . . .

Stromateus stellatus Cuvier, 1829
Pacific Ocean - Chile and Peru, rarely as far north as Lima or as far south as 45°S.

D V-VIII 39-45. A II-III 36-44. P 19-22. Vertebrae 17-18 + 24-26.

Stromateus brasiliensis Fowler, 1906
Atlantic Ocean - Uruguay south to Tierra del Fuego and the Falkland Islands

D V-VI 43-47. A II-III 39-43. P 19-23.

Vertebrae 16-20 + 27-29.

Stromateus maculatus Cuvier and Valenciennes, 1833, a junior synonym of *S. stellatus*, is the name most frequently used for the Pacific population and is also generally applied to the Atlantic population. Whether *S. stellatus* and *S. brasiliensis* are to be regarded as distinct species is uncertain; allopatry is apparent. Vertebral

counts of *S. brasiliensis* are slightly higher (43-48, usually 45 or 46) than those of *S. stellatus* (41-44, usually 43). Differences in certain body proportions, including head length, eye diameter, pectoral fin length, and body depth, seem apparent, but specimens of less than 250 mm SL of the Atlantic population are needed in order to draw more definite conclusions. The systematics and zoogeography of this genus are currently being studied by Horn.

Key to the species in *TETRAGONURUS*

1 (4). Vertebrae 40-51. Lateral series of scales to origin of caudal keels 73-95. Origin of dorsal above middle of pectoral fin or above its posterior third in adult; usually above middle or anterior half of pectoral fin in young. Origin of ventrals usually beneath pectoral base in very young specimens, not far behind it in adults. In adult, distance between upper angle of pectoral and insertion of ventral less than diameter of eye; interorbital distance and eye diameter very nearly equal; and snout slightly longer than diameter of eye. Larvae and small scaleless specimens without pigment on caudal fin or on end of caudal peduncle beyond urostyle. 2

2 (3). Dorsal spines 10-11. Vertebrae 40-43. Lateral series of scales to origin of caudal keels about 73-78. Ventrals appear at 5-5.5 mm SL. Dorsal spines formed at about 7 mm SL. No pigment spots on body behind vent until longer than about 13 mm SL, this posterior area still paler than anterior part of body in the largest specimen seen, 16.6 mm SL. Dorsal X-XI, 10-12; anal I 10-12; pectoral 15-17. . . . . .

Tetragonurus pacificus Abe, 1953
Pacific and Indian Oceans

3 (2). Dorsal spines 14-17. Vertebrae 45-51. Lateral series of scales to origin of caudal keels 83-95. Ventrals appear at about 6 mm SL. Dorsal spines formed at 8-10 mm SL. Pigment on small scaleless specimens extending to base of urostyle. Dorsal XIV-XVII, 10-13; anal I 9-12; pectoral 14-18 . . . . . .

Tetragonurus atlanticus Lowe, 1839
Atlantic, Pacific, and Indian Oceans

4 (1). Vertebrae 52-58. Lateral series of scales to origin of caudal keels 97-114. Origin of dorsal behind end of pectoral fin or above its tip in adult, over the posterior half (sometimes middle) in young. Origin of ventrals well behind base of pectoral in adult, sometimes in very young just behind it. In adult, distance between upper angle of pectoral and insertion of ventral greater than diameter of eye, interorbital distance slightly greater than eye diameter, snout considerably longer than eye diameter. Larval and small scaleless specimens normally with some pigment at end of caudal peduncle and on base of caudal fin, this pigment sometimes fading in alcohol in smallest specimens. Dorsal XV-XXI, 10-17; anal I 10-15; pectoral 14-21. . . . . .

Tetragonurus cuvieri Risso, 1810
Mediterranean Sea, Atlantic and
Pacific Oceans

This key has been adapted from M. Grey - "The fishes of the genus *Tetragonurus* Risso", DANA-Report No. 41: 1-75(1955).

Woods Hole Oceanographic Institution
Reference No. 69-70

A KEY TO THE STROMATEOID FISHES by Richard L. Haedrich and Michael H. Horn. 50 pages. September 1969. NSF Grants GB-7108 and GZ-259.

Tentative keys to the stromateoid fishes, intended primarily as an aid to field workers and curators, summarize the current state of our knowledge of these animals. Six families, 15 genera, and 60 species are recognized. Larvae are not discussed. General range maps and an illustration of one representative member of each genus are included.

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2. Stromateoid
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